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(71) Applicant(s)

**Suncrest Surrounds Ltd**  
(Incorporated in the United Kingdom)  
2 Swan Road, PETERLEE, Co Durham,  
SR8 SHS, United Kingdom

(72) Inventor(s)

**Robert Ian Cummings**  
**Christopher Winn**

(74) Agent and/or Address for Service

**Withers & Rogers**  
Goldings House, 2 Hays Lane, LONDON,  
SE1 2HW, United Kingdom

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**F4W W57**

(56) Documents Cited

**GB 2372807 A**

**GB 2350670 A**

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(58) Field of Search

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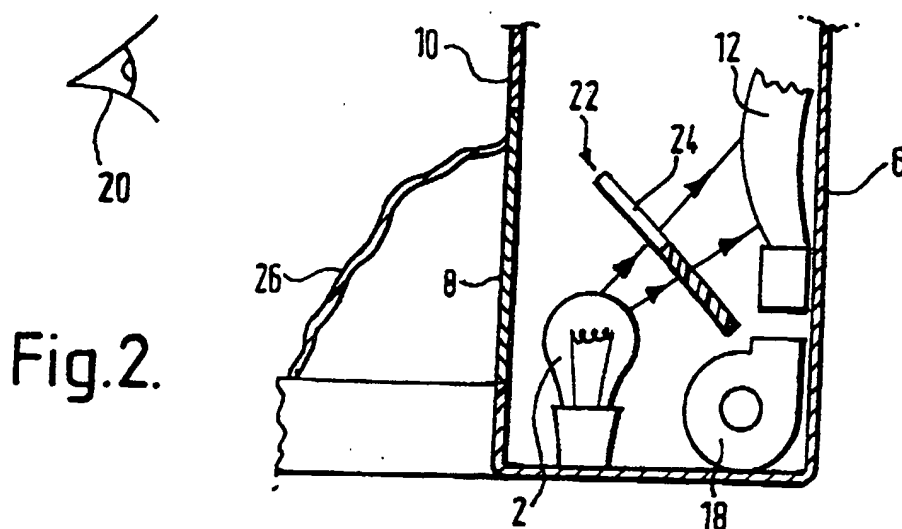
**Other: Online databases: WPI, EPODOC, JAPIO**

(54) Abstract Title

**Apparatus for simulating flames**

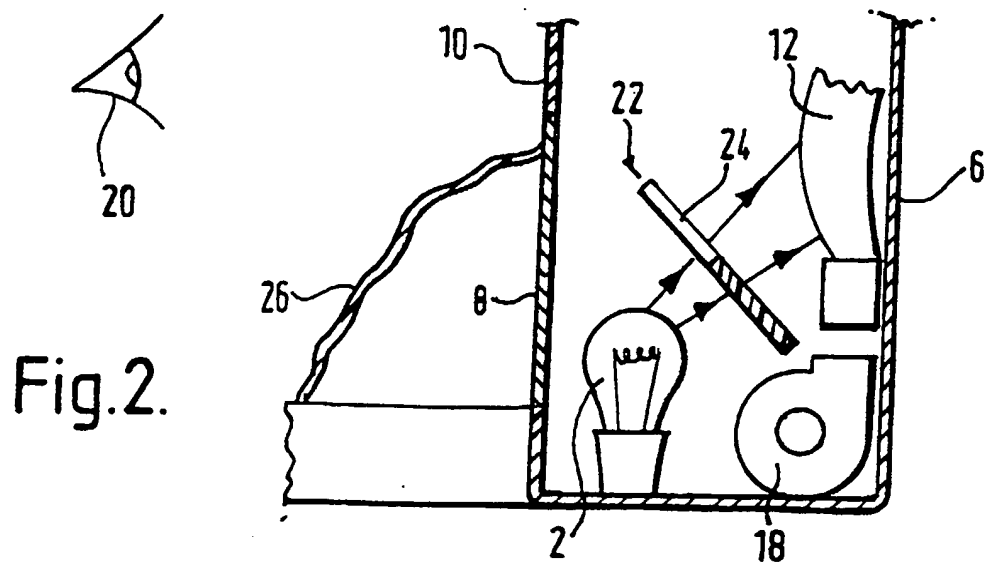
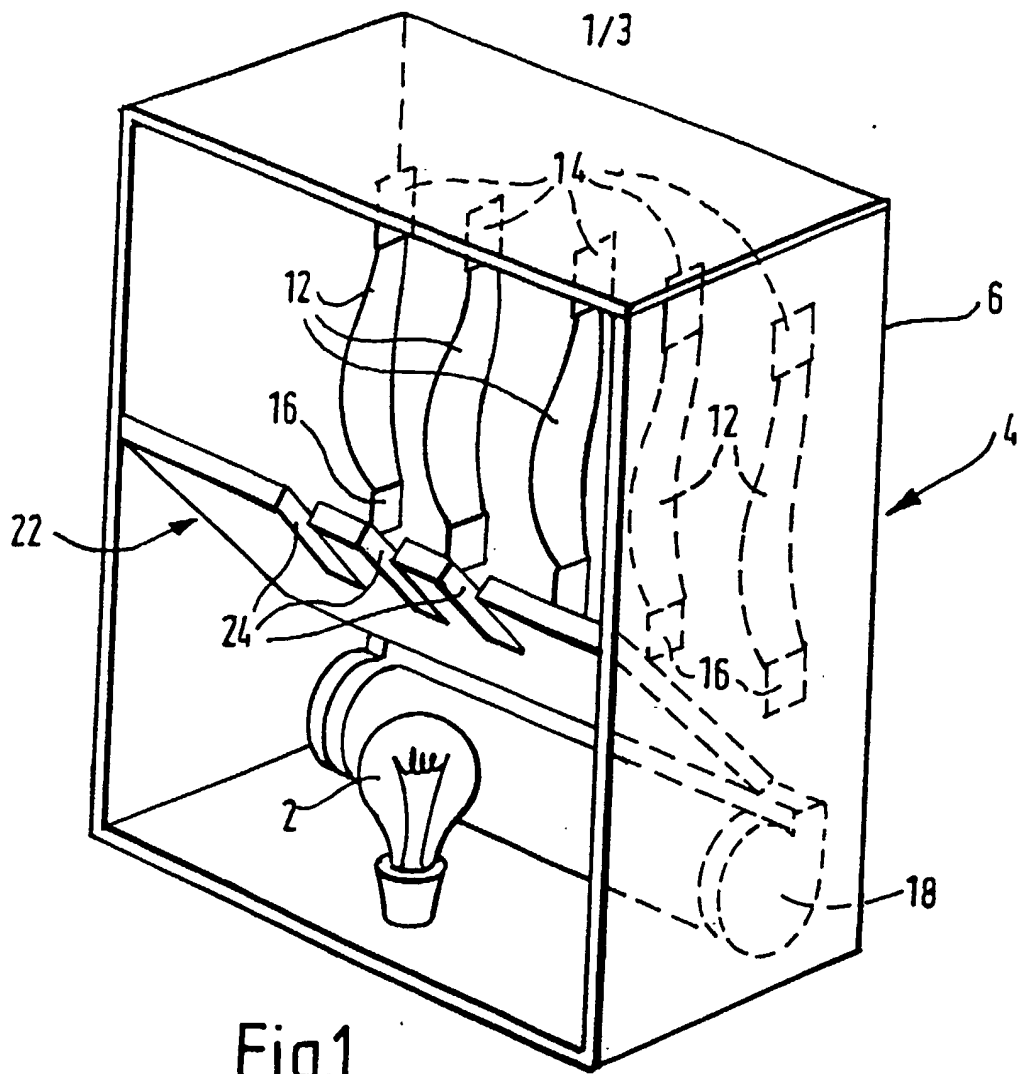
(57) An apparatus for simulating flames wherein light 2 is directed onto a moveable reflector 12 and then as light of more than one colour onto a diffusing screen 10. A coloured, transparent, diffuse screen 22 may be between the light source 2 and diffusing screen 10, preferably between the light and reflector 12. The screen may have different coloured regions or be entirely one colour and the reflector may be a further colour. The screen may be mounted such that all or some light passes through the screen. The screen may have apertures or a contoured edge 24 to let white light through to the reflector 12. The screen may be comprised of 2 sheets spaced so as to allow white light to pass between. The reflector 12 may comprise loosely hung ribbons moved by a fan 18. Coal/logs may be simulated by a contoured sheet 26. There may be an electric heater.

Also claimed is an arrangement in which a simulated flame image, produced on a diffuse screen is visible through simulated fuel.



**Fig. 2.**

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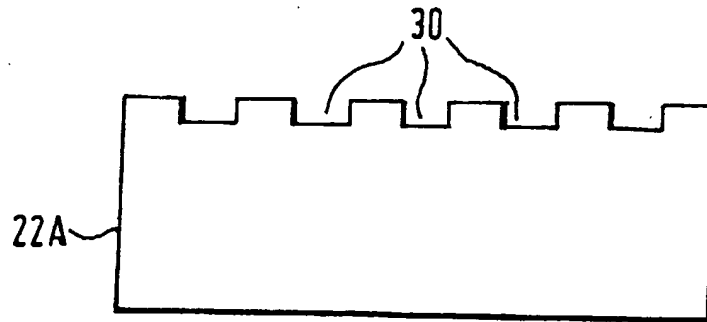


Fig. 3A.

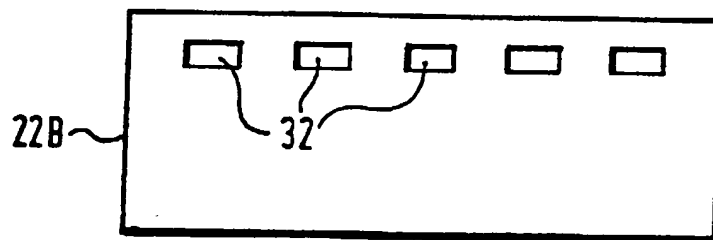
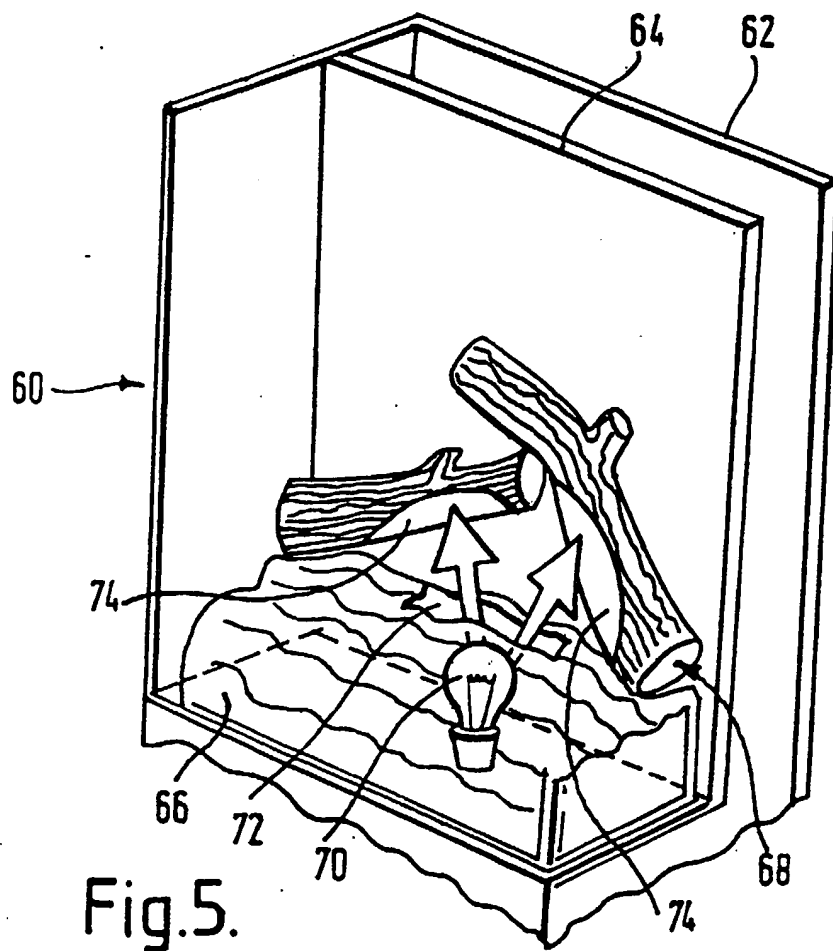
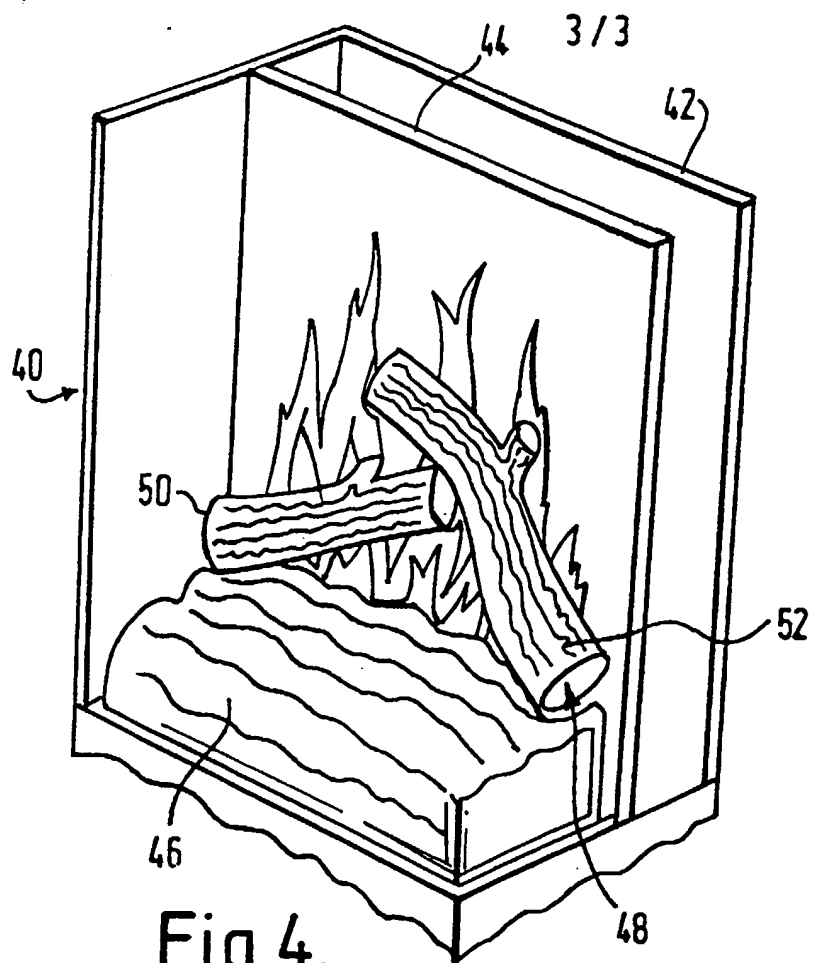


Fig. 3B.



Fig. 3C.



## Flame Simulation

This invention relates to the simulation of the flame effect of a solid fuel fire, and finds application, for example, in a flame effect electric heater. It is also envisaged, however, that the invention may be used independently of the provision of heating, that is to say, as a visual display.

Arrangements are known for simulating the effect of flames arising from the burning of solid fuel, such as coal or logs. Typically these are based either on reflection of light from twisting ribbons or from a rotating member e.g. disc or cone, and provide greater or lesser realism. Light, usually from an electric bulb, is directed onto the moving ribbons, disc or cone, reflected therefrom in various ways as the reflector moves, and is then transmitted out through the front of the apparatus through a diffuse screen to the observer. The diffuse nature of the screen masks the precise form of the reflective member so that the observer is presented with a moving pattern that simulates flames. The effect is enhanced by the appropriate use of colour of the components in the light path. In a coal or log effect fire, the flickering light may also be directed through an arrangement simulating a pile of coals or logs, for example in the form of a suitably-contoured sheet of plastics material.

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It is an object of the present invention to provide a method and apparatus in which an improved simulated flame effect is produced.

In accordance with one aspect of the present invention there is provided apparatus for simulating the effect of flames, for example from a solid fuel fire, in which a light source is arranged to direct light (of a single colour) onto a reflective movable member and hence through a diffuse screen, wherein the light falling on the screen is arranged to be of at least two colours.

30 Preferably, the multi-coloured light effect is produced by means of a further screen that is interposed in the light path between the light source and the diffuse screen and that is

arranged to affect the colour of the image produced on the diffuse screen by the reflection from the movable member. Advantageously, the further or intermediate, screen is mounted in the light path between the light source and the movable member.

- 5 The dual or multi-coloured light may be produced by selection of appropriate colours for the light source, the movable member, and the intermediate screen.

The intermediate screen is preferably substantially transparent but alternatively it may be diffuse.

10

Preferably the intermediate screen is made of a plastics material, for example an acrylic, or it may be made of glass.

- 15 The intermediate screen may be mounted such that all the light from the light source that reaches the movable member passes therethrough. In this embodiment, the screen may be predominantly of one colour, or be clear, and may have regions of a different colour produced for example by tinting or by attachment of coloured patches.

- 20 Alternatively, the intermediate screen may be arranged to interrupt only some of the light from the light source. Thus, the screen may contain apertures therethrough, may have slots cut into an edge thereof, or may have a contoured edge. In this embodiment, the screen may be wholly of one colour, and the light source may emit white light, so that light falling on the movable member that has passed through the intermediate screen will be coloured, whilst light falling thereon that passes through gaps in, or
- 25 around, the screen will be white.

In a preferred embodiment, the light source emits white light, the movable member has a reflective surface of a first colour, for example blue, and the intermediate screen provides a second colour, for example orange.

30

The intermediate screen may comprise a rectilinear sheet, or two or more such sheets arranged side-by-side. In the latter arrangement, the sheets may be spaced apart so that

the two-colour effect is achieved by, on the one hand, light that passes through the sheets and, on the other hand, by light that passes through the gaps therebetween.

Preferably, the movable member may be an array that comprises one or more reflective  
5 ribbons. The ribbons are advantageously arranged to hang substantially vertically, spaced apart transversely of one another, being supported loosely, advantageously at the top and bottom, so that they can flex and twist. The ribbons may be made of any suitable material, such as a fabric, plastics, metal or metallic material, and one of their major surfaces may be more reflective than the other. The ribbons may be caused to  
10 move by air being directed onto them, for example from a fan mounted beneath them.

In accordance with another aspect of the present invention, there is provided a method of simulating the effect of flames, wherein a single colour light source is arranged to direct light onto a reflective movable member and thence through a diffuse screen, and  
15 wherein the light falling on the screen is arranged to be of at least two colours, preferably by being passed through an intermediate, coloured screen.

Advantageously, the method of the invention is put into effect using the apparatus of the invention.

20

Thus, in accordance with the present invention, light from a single colour, preferably white, light source can be directed, for example, onto twisting reflective ribbons of another colour in order to produce an image on a diffuse screen of flickering flames, and by interposing a transparent screen of yet another colour, the flames may appear in  
25 two colours. Advantageously, the flame image may be essentially orange or red, this colour being produced by the colouring of the intermediate screen, and have flashes of blue or yellow associated therewith, these colours being produced by a combination of the reflection of all the light coming from the light source and the colour of the movable member.

30

The apparatus of the invention may also comprise a simulated coal or log effect by mounting a suitably-contoured and coloured sheet or moulding, which may comprise

transparent and opaque portions, in front of the diffuse screen, thereby to enhance the visual effect of flames arising from burning coal or logs.

5 In accordance with a further aspect of the present invention, there is provided an arrangement for simulating the effect of burning the fuel, such as logs or coals, of a fire in which a simulated flame image is produced on a diffuse screen, simulated fuel is located in front of the screen, and the simulated fuel is arranged such that a portion of the screen bearing the simulated flame image is visible therethrough.

10 In the case of simulated logs, for example, the log arrangement may be such that stacking of some of them forms an arch or bridge over a base of the remainder, providing a gap through which the simulated flames on the diffuse screen behind are visible. In this way, the simulated flames are visible through as well as above the simulated fuel, and seem to emanate from all portions thereof.

15

Preferably, the lower and underside portions of the simulated fuel that provides the gap, are provided with a localised reflective surface, for example by being painted so that such portions appear to be glowing.

20 Advantageously, the base of the simulated fuel in the region beneath the elevated fuel is slit, or otherwise made transparent, so that light from a light source, for example a clear electric light bulb, located beneath the surface defining the simulated fuel, is directed onto the underside of that portion of the fuel beneath which the screen is visible.

25 The effect of burning of the simulated fuel is thus enhanced.

It will be appreciated that this further aspect of the present invention may be used alone or in combination with the previous aspects of the present invention.

30 The apparatus of the present invention may also comprise a heater, for example an electric heater, which may be in the form of a warm air, fan-assisted, or electric heating element heater.



Although the preferred form of movable member is an array of freely-mounted reflective ribbons, it will be appreciated that the physical movement of the flame effect may be provided in other ways. For example, a disc or cone may be rotatably mounted  
 5 in the light path and be appropriately coloured, contoured, apertured etc, so as to achieve the effect of producing another colour in the simulated flame image.

Flame simulation arrangements, each in accordance with the present invention, will now be described, by way of example, with reference to the accompanying drawings, in  
 10 which:-

- Figure 1 is a perspective view of part of a first arrangement;
- Figure 2 is a part sectional elevation of the first arrangement;
- Figure 3A, B and C are front views of different screens for use in the first arrangement;
- Figure 4 is a schematic perspective view of a second arrangement; and
- 15 Figure 5 is a schematic perspective view of a third arrangement.

Referring to Figures 1 and 2, a flame simulation arrangement comprises a clear, white electric light bulb 2 that is vertically mounted in the base of a casing 4. The casing 4 is a generally rectangular, box-like configuration, having a metal back panel 6 and a  
 20 composite front panel having a lower, opaque portion 8 and an upper portion 10 that comprises a transparent, diffuse screen 10. Five blue-coloured fabric ribbons 12 are mounted within the casing 4 adjacent its back panel 6, and are secured at upper and lower mounting brackets 14 and 16 respectively. An elongate fan 18 is mounted below the ribbons 12 and arranged to direct air upwardly thereonto. The ribbons 12 are  
 25 loosely mounted at 14 and 16 so that they are arranged to flex and twist, at up to 90 degrees of arc, in the air flow from the fan 18. One major surface of each of the ribbons 12 is more reflective than the other, by being provided with a sheen.

As can be seen from Figure 2, light from the bulb 2 falls onto the twisting ribbons 12, and when this is viewed by an observer 20 standing in front of the casing 4, a flickering  
 30 effect is observed on the diffuse screen 10. Also located within the casing 4 is a further screen 22, which is mounted orthogonally to the lightpath between the light bulb and

the ribbons 12. The screen 22 is of generally rectangular configuration, and extends completely across the casing 4. Three slots 24 are cut into the screen 22 from its uppermost surface. The screen 22 is made from an acrylic plastics material, is transparent, and is tinted so as to have an orange colour.

5

The presence of the screen 22 is such that some of the light from the bulb 2 reaches the ribbons 12 directly through the slots 24 and is thus incident thereon as white light, whilst some of the light from the bulb 2 reaches the ribbons 12 through the orange-tinted screen 22. The effect of the two coloured lightpaths impinging the moving ribbons 12, is noted by the observer 20 as a flickering of flames on the diffuse screen 10, not only with the light intensity varying depending on whether the more highly reflective surface of a ribbon 12 is reflecting at that time, but also on whether light incident on the ribbons 12 is received through the screen 22 or through the slots 24. The resultant effect is that whilst a generally orange flame is observed moving on the screen 10, this is interspersed with flashes of a different colour, being blue or green in the present example.

As can be seen from Figure 2, the opaque portion 8 of the front wall of the casing 4 ensures that no direct light from the bulb 2 is visible to the observer 20, nor is the screen 22 visible. Additionally, a simulated coal bed 26 is provided at the bottom of the casing 4 beneath the diffuse screen 10. The overall appearance to the observer 20 is, therefore, that of flickering flames of different colours appearing on the screen 10 above a simulated coal bed 26.

In Figure 3A, a modification of the screen 22 is shown, in which a screen 22A is castellated along its upper surface, whereby the indentations 30 do not extend as far into the screen 22A as do the slots 24 into the screen 22.

Referring to Figure 3B, a further modified form of the screen 22, identified as screen 22B, is shown, in which apertures 32 are provided through the tinted screen 22B, in place of the slits 24.

A further modification of the screen 22 is shown in Figure 3C, in which the upper surface of a screen 22C is of wave-, generally sinusoidal-form, having troughs 34.

In a still further modification of the intermediate screen 22, its height is restricted, or it is positioned, so that some light from the light source passes therethrough and some light passes therearound, preferably thereover. In a simple form, the intermediate screen is of generally rectangular configuration and is mounted such that only the lower portions of all the ribbons 12 receive light that has passed therethrough whilst the upper ribbon portions receive light directly from the light source over the top of the screen.

10

It will be appreciated that the screens 22A, B and C achieve the same effect as the screen 22, namely of providing two lightpaths between the light bulb 2 and the ribbons 12, whereby some of the light passes through the tinted screen, and other light, white light, passes directly onto the ribbons 12. It is also envisaged, that the slots 30, cutouts 32, troughs 34 and the slits 24, may alternatively be filled in or covered by material that is clear, or has a still further different colour from that of the screen and the ribbons 12, thereby introducing different colour effects on the diffuse screen 10 in the simulated flame image.

20 It will also be appreciated, that the number, shape and transverse location of the cutouts or inserts on the screen 22 may be modified, optionally in accordance with the location and number of the ribbons 12, to provide any desired flame effect on the diffuse screen 10.

25 Furthermore, it will be appreciated that various colours may be provided for the light source 2, the screens 22, the cutouts therein, and the ribbons 12, so as to provide different colour effects on the diffuse screen 10.

Referring to Figure 4, simulated flame effect apparatus 40 comprises a generally rectangular casing 42 and a diffuse screen 44. The screen 44 may be the screen 22 of the previous embodiments, and it is to be understood that the arrangement for

30

providing a simulated flame effect on the screen 44 may be as disclosed with respect to Figures 1 to 3, or may be any other suitable means for providing a flame effect.

5 The apparatus 40 also has a simulated log effect that comprises a base portion 46, and a single upper log 48 having the appearance of two portions 50, 52 that form an arch above the base 46. As can be seen from the Figure, a gap exists between the log 48 and the base portion 46 of the simulated fuel such that a portion of the diffuse screen 44 can be seen therethrough. To an observer standing in front of the apparatus 40, therefore, the appearance is that of flames existing beneath the log 48 and also above the entire  
10 fuel effect arrangement.

It will be appreciated, that the fuel effect arrangement, comprising the base portion 46 and the upper arch log 48, can be provided as a single moulding of a plastics material.

15 Referring to Figure 5, flame effect apparatus 60 comprises a generally rectangular housing 62 and a diffuse screen 64, generally arranged as described with respect to the previous embodiments. Also shown is a simulated log fuel effect arrangement located in front of the screen 44, which comprises a log base 66, and an arched log arrangement 68 extended thereover so that, as described with reference to the embodiment of Figure  
20 4 a portion of the screen 64 can be viewed above the log base 66 and beneath the upper logs 68.

The log base 66 is shown partially cut away to reveal a light source in the form of an electric bulb 70 mounted therebeneath. The log base 66 is also provided with a series  
25 of slits 72 in its upper surface generally located beneath the log arch 68. The underside regions 74 of the arched log 68 are provided with a reflective surface.

To the observer standing in front of the apparatus 60, not only will the flickering flames be viewed on the screen 64, but also light from the bulb 70 and passing through the slits  
30 72 will be reflected from the coated portions 74 of the arch log 68. The effect of this on the observer is that the underside of the top log 68 appears to be burning.

It will be appreciated that the various embodiments described herein for enhancing the flame or burning effect may be used separately or in any suitable combination.

## Claims

1. Apparatus for simulating the effect of flames, in which a light source is arranged  
5 to direct light onto a reflective movable member and thence through a diffuse screen,  
wherein the light falling on the screen is arranged to be of at least two colours.
2. Apparatus according to claim 1, wherein the light source is arranged to produce  
light of substantially one colour.
- 10 3. Apparatus according to claim 1 or claim 2, wherein the multi-coloured light effect  
is produced by means of a further screen that is interposed in the light path between the  
light source and the diffuse screen and that is arranged to affect the colour of the image  
produced on the diffuse screen by the reflection from the movable member.
- 15 4. Apparatus according to claim 3, wherein the further screen is mounted in the light  
path between the light source and the movable member.
5. Apparatus according to any one of the preceding claims, wherein the  
20 multi-coloured light is produced by selection of appropriate colours for the light source,  
the movable member, and the further screen.
6. Apparatus according to any one of claims 3 to 5, wherein the further screen is  
substantially transparent.
- 25 7. Apparatus according to any one of claims 3 to 5, wherein the further screen is  
diffuse.
8. Apparatus according to anyone of claims 3 to 5, wherein the further screen is made  
30 of a plastics material, preferably an acrylic, or of glass.

9. Apparatus according to anyone of claims 3 to 8, wherein the further screen is mounted such that substantially all the light from the light source that reaches the movable member passes therethrough.
- 5 10. Apparatus according to claim 9, wherein the further screen is predominantly of one colour, or is clear.
11. Apparatus according to claim 9 or 10, wherein the further screen has regions of a different colour, produced preferably by tinting or by attachment of coloured patches.
- 10 12. Apparatus according to any one of claims 3 to 8, wherein the further screen is arranged to interrupt only some of the light from the light source.
13. Apparatus according to claim 12, wherein the further screen contains apertures therethrough, and/or has slots cut into an edge thereof, and/or has a contoured edge.
- 15 14. Apparatus according to claim 13, wherein the further screen is wholly of one colour, and the light source emits white light, so that light falling on the movable member that has passed through the further screen will be coloured, whilst light falling thereon that passes through gaps in, or around, the screen will be white.
- 20 15. Apparatus according to any one of claims 3 to 14, wherein the light source emits white light, the movable member has a reflective surface of a first colour, and the further screen provides a second colour.
- 25 16. Apparatus according to any one of claims 3 to 15, wherein the further screen comprises a rectilinear sheet, or two or more such sheets arranged side-by-side.
17. Apparatus according to claim 16, wherein the sheets are spaced apart so that the two-colour effect is achieved by, on the one hand, light that passes through the sheets and, on the other hand, by light that passes through the gaps therebetween.
- 30

18. Apparatus according to any one of the preceding claims, wherein the movable member is an array that comprises one or more reflective ribbons.

19. Apparatus according to claim 18, wherein the ribbons are arranged to hang  
5 substantially vertically, spaced apart transversely of one another, being supported loosely, preferably at the top and bottom, so that they can flex and twist.

20. Apparatus according to claim 18 or 19, wherein the ribbons are made of a fabric,  
10 plastics, metal or metallic material, and one of their major surfaces is more reflective than the other.

21. Apparatus according to any one of the preceding claims wherein the movable  
15 member is caused to move by air being directed thereonto, preferably from a fan mounted therebeneath.

22. Apparatus according to any one of claims 1 to 21, comprising a simulated coal or  
20 log effect by mounting a suitably-contoured and coloured sheet, or moulding, in front of the diffuse screen, thereby to enhance the visual effect of flames arising from burning coal or logs.

23. Apparatus according to claim 22, wherein the sheet comprises transparent and  
opaque portions.

24. Apparatus according to any one of the preceding claims, comprising a heater,  
25 preferably an electric heater, preferably in the form of a warm air, fan-assisted, or electric heating element heater.

25. An arrangement for simulating the effect of burning the fuel, such as logs or coals,  
30 of a fire in which a simulated flame image is produced on a diffuse screen, simulated fuel is located in front of the screen, and the simulated fuel is arranged such that a portion of the screen bearing the simulated flame image is visible therethrough.



26. A method of simulating the effect of flames, wherein a single colour light source is arranged to direct light onto a reflective movable member and thence through a diffuse screen, and wherein the light falling on the screen is arranged to be of at least two colours, preferably by being passed through an intermediate, coloured screen.

5

27. Apparatus, arrangement and method for simulating the effect of flames, substantially as hereinbefore described with reference to the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0114030.0  
Claims searched: 1,26

14

Examiner: Dr Hazel Oliver  
Date of search: 18 December 2002

## Patents Act 1977 : Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1-4,6,8,9, 11,16,22, 24,26	GB 2276444 A	UNIDARE: fig 1, whole document
X	1-3,5, 15,18-22	GB 2325733 A	BURLEY: fig 1, see whole document
X	1-3,8,11, 12,22,24, 26	EP 1020685 A2	MAJESTIC: fig 3, paras 19, 27-33
X	1,2,22	GB 2372807 A	BASIC: fig 2, pg 3 lines 6, 25.
X	1	GB 2350670 A	DANIEL: fig 1, pg 3 para 7, pg 6 para 4.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>T</sup>:

F4W

Worldwide search of patent documents classified in the following areas of the IPC<sup>T</sup>:

F24C

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC, JAPIO